

CLAIMS

1. A hydrogen gas humidity control apparatus, characterized by comprising:

 a first hydrogen flow path or hydrogen chamber to which at least hydrogen gas is supplied;

 a second hydrogen flow path or hydrogen chamber to which at least hydrogen gas is supplied; and

 a moisture carrier for separating the first hydrogen flow path or hydrogen chamber from the second hydrogen flow path or hydrogen chamber and for allowing water and/or water vapor to pass therethrough.

2. The hydrogen gas humidity control apparatus according to claim 1, characterized in that:

 the hydrogen gas is hydrogen gas generated by fuel reforming.

3. A hydrogen gas humidity control apparatus, characterized by comprising:

 a first hydrogen flow path or hydrogen chamber to which at least hydrogen gas is supplied;

 a second hydrogen flow path or hydrogen chamber to which at least hydrogen gas is supplied; and

 a proton conductor for separating the first hydrogen flow path or hydrogen chamber from the second hydrogen flow path or hydrogen chamber.

4. The hydrogen gas humidity control apparatus according to claim 3, characterized in that:

 the proton conductor has a catalyst disposed on at least

one surface of the proton conductor selected from the surface facing the first hydrogen flow path or hydrogen chamber and the surface facing the second hydrogen flow path or hydrogen chamber.

5. The hydrogen gas humidity control apparatus according to claim 3, characterized in that:

a first voltage application electrode is provided to the first hydrogen flow path or hydrogen chamber;

a second voltage application electrode is provided to the second hydrogen flow path or hydrogen chamber; and

the proton conductor is sandwiched between the first voltage application electrode and the second voltage application electrode.

6. The hydrogen gas humidity control apparatus according to claim 3, characterized in that:

a voltage is applied to a portion between the first voltage application electrode and the second voltage application electrode.

7. The hydrogen gas humidity control apparatus according to claim 4, characterized in that:

the catalyst contains platinum.

8. The hydrogen gas humidity control apparatus according to claim 3, characterized in that:

the hydrogen gas is hydrogen gas generated by fuel reforming.

9. A fuel cell, characterized by comprising:

- at least one or two or more power-generating cell having a fuel electrode-side separator to which a fuel is supplied,
- an oxidizer electrode-side separator to which an oxidizer is supplied, and
- a proton conductor membrane electrode assembly sandwiched between the fuel electrode-side separator and the oxidizer electrode-side separator; and
- at least one or two or more hydrogen gas humidity control apparatus, which is incorporated to a hydrogen flow path and/or hydrogen chamber to which the fuel is supplied; wherein the hydrogen gas humidity control apparatus having
 - a first substrate,
 - a second substrate, and
 - a moisture carrier sandwiched between the first substrate and the second substrate;wherein mixed gas of hydrogen and water and/or water vapor is in contact with the first substrate and at least hydrogen is in contact with the second substrate.

10. A fuel cell, characterized by comprising:

- one or two or more power-generating cell having a fuel electrode-side separator to which a fuel is supplied,
- an oxidizer electrode-side separator to which an oxidizer is supplied, and
- a proton conductor membrane electrode assembly sandwiched between the fuel electrode-side separator and the oxidizer electrode-side separator; and
- one or two or more hydrogen gas humidity control

apparatus, which is incorporated to a hydrogen flow path and/or hydrogen chamber to which the fuel is supplied;

wherein the hydrogen gas humidity control apparatus having

a first electrode,

a second electrode, and

a proton conductor sandwiched between the first electrode and the second electrode;

wherein mixed gas of hydrogen and water and/or water vapor is in contact with the first electrode and at least hydrogen is in contact with the second electrode.

11. A hydrogen gas humidity control method, characterized by comprising the steps of:

holding a proton conductor by sandwiching between a first electrode and a second electrode, and

applying a voltage to a portion between the first electrode and the second electrode;

wherein moisture is carried between hydrogen supplied from a fuel electrode of a fuel cell and hydrogen in contact with the second electrode and having a humidity different from that of the hydrogen in contact with the first electrode.

12. A fuel cell, characterized by comprising:

a power-generating cell having an electrolyte sandwiched between a fuel electrode and an oxygen electrode;

an oxygen electrode-side separator having formed therein an oxygen flow path through which oxygen is supplied to the oxygen electrode;

a fuel electrode-side separator having formed therein a fuel flow path through which fuel gas is supplied to the

fuel electrode; and

a moisture carrier disposed in contact with the fuel gas and in contact with discharged gas having a humidity different from that of the fuel gas to carry moisture between the fuel gas and the discharged gas.

13. The fuel cell according to claim 12, characterized by comprising:

a discharge flow path through which discharged gas flows.

14. The fuel cell according to claim 12, characterized in that:

the fuel cell has a plurality of the power-generating cells;

the moisture carrier is disposed between a first power-generating and a second power-generating; and

the discharged gas in contact with the moisture carrier contains oxygen and is supplied to the second power-generating cell.

15. The fuel cell according to claim 12, characterized in that the moisture carrier contains a perfluorosulfonic acid polymer.

16. The fuel cell according to claim 12, characterized in that air existing outside of the fuel cell is used as the discharged gas.

17. A humidity control method for a fuel cell, characterized by comprising the steps of:

providing a moisture carrier so as to be in contact with fuel gas to be supplied to the fuel electrode side of a fuel cell;

separating discharged gas having a humidity different from that of the fuel gas and the fuel gas by the moisture carrier; and

carrying moisture between the fuel gas and the discharged gas using the moisture carrier.

18. The humidity control method for a fuel cell according to claim 17, characterized in that:

the discharged gas contains oxygen and is supplied to an oxygen electrode side of the fuel cell.

19. The humidity control method for a fuel cell according to claim 17, characterized in that:

air existing outside of the fuel cell is used as the discharged gas.